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Gypsy Moth

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The gypsy moth (*Porthetria dispar* L.), now one of our most widely known forest insects, was accidentally introduced from Europe at Medford, Mass., in 1869. Since that time the Federal Government and various Northeastern States have spent at least 75 million dollars on control measures aimed primarily at limiting damage during outbreaks and preventing spread to the south and west.

Distribution

The area now generally infested by the gypsy moth covers much of New England, eastern New York, a small area in northwestern New Jersey, and a similar area in northeastern Pennsylvania. In addition, isolated infestations occur near Scranton, Pa., and Lansing, Mich. (fig. 1).

Description

The male gypsy moth (fig. 2, *A*) is dark brown with blackish bands across its forewings. The female (fig. 2, *B*) is nearly white and has wavy blackish bands across its forewings. The wing expanse is about 2 inches.

The mature larva (fig. 2, *D*) is a hairy caterpillar, 1½ to 2½ inches long. The head has yellow markings, the body is slate colored, and on the back there is a double row of five pairs of blue spots followed

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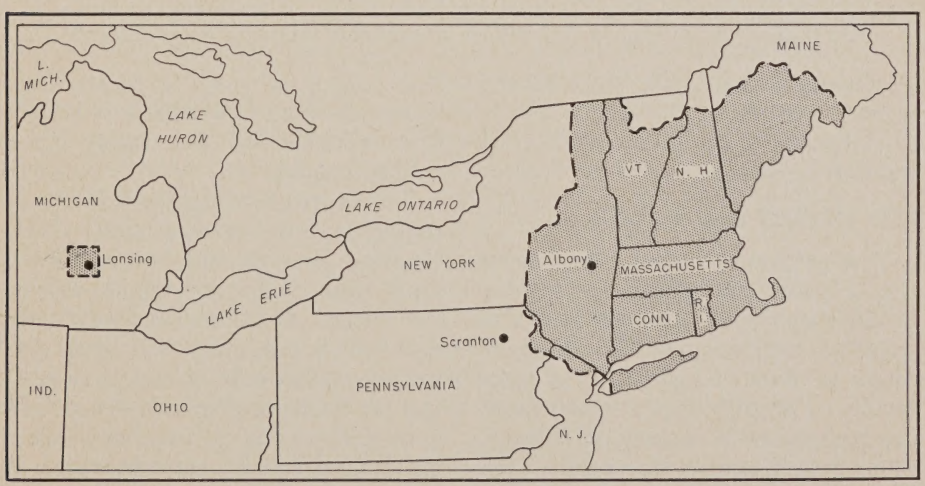

FIGURE 1.—Present distribution of the gypsy moth within the United States.

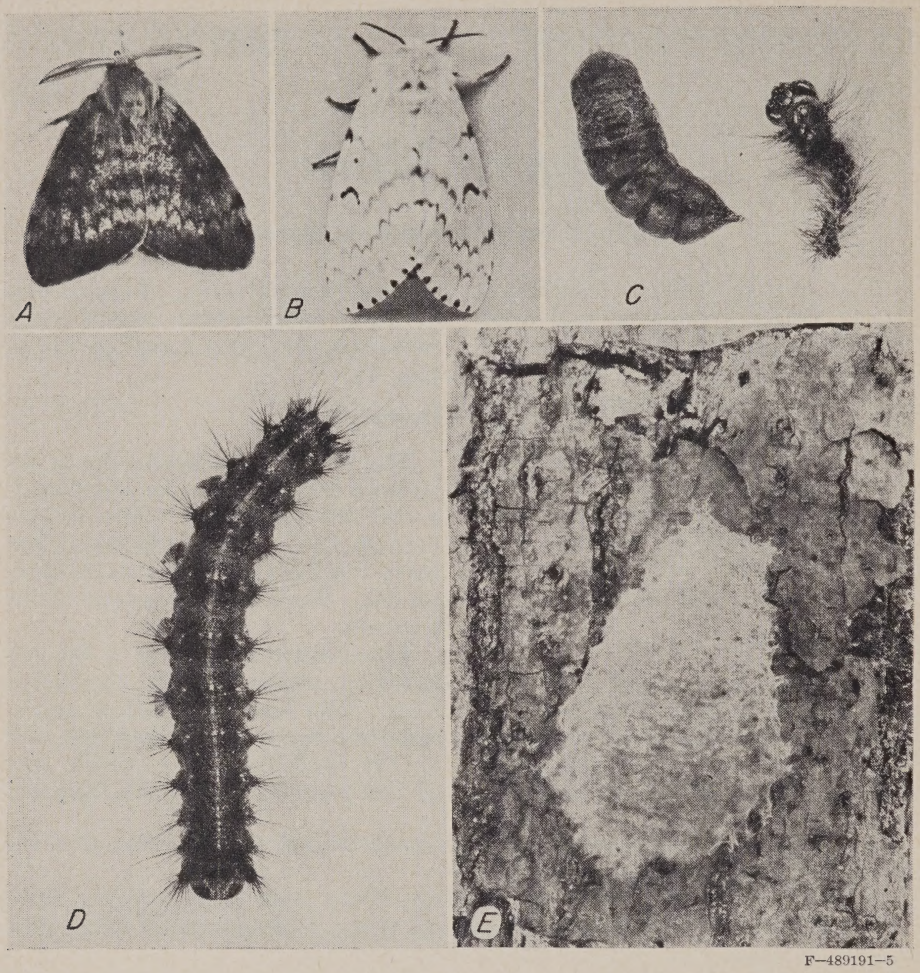

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FIGURE 2.—*A*, Adult male gypsy moth; *B*, adult female; *C*, female pupa and cast larval skin; *D*, full-grown caterpillar; *E*, egg mass laid on a white oak tree.

by a double row of six pairs of red spots. The pupa (fig. 2, *C*) is reddish brown with a sprinkling of reddish hairs.

Life History and Habits

The gypsy moth has one generation a year. It spends the winter in the egg stage. As soon as warm weather arrives, usually in early May in New England, the eggs hatch. The tiny larvae crawl from the egg mass in search of foliage, sometimes spinning down on silken threads as they move around. At this time they may be blown considerable distances, and it is in this first larval instar that most windspread occurs.

The larval feeding period is completed late in June or early July. During this period, male larvae molt four times and female larvae five times. If the larvae completely defoliate a tree they will often migrate considerable distances searching for food; and in any event full-grown larvae may wander about a good deal before transforming to pupae.

The pupae are attached by silken threads to limbs and trunks of trees, stones, forest debris, and the like. Large numbers are often massed together. From 10 days to 2 weeks are spent in the pupal stage.

The male moths are strong fliers, and they fly vigorously in a zig-zag course on warm days. The females have large, heavy abdomens and they do not fly. When the female moth emerges, she crawls a short distance, her wings expand, and mating usually occurs soon after. Immediately after mating, the female lays eggs. They are deposited in oval masses, covered with buff-colored hairs from the female's abdomen (fig. 2, *E*), and they contain 100 to 1,000 eggs. A large proportion of the egg masses are laid on the trunks and branches of trees, but they may be laid in almost any conceivable place such as under stones, inside hollow stumps, on dead leaves, or on buildings.

Host Trees

Gypsy moth caterpillars feed on the foliage of a wide variety of trees and shrubs. In heavy infestations, few host species are ignored by the larger larvae. Like other defoliators, though, the caterpillars have distinct food preferences. these were listed in four classes by Mosher (1915) ; an abbreviated list follows:

1. Species that are favored food on which gypsy moth larvae flourish: oaks, birches (except yellow and black), larch, linden, willows, poplars, apple, and speckled alder.

2. Species that are favored food for larvae after the earlier larval stages: chestnut, hemlock, pines, and spruces.

3. Species not particularly favored but upon which some larvae may develop: black and yellow birch, cherries, elms, hickories, and maples.

4. Unfavored food: ashes, butternut, walnut, locust, sycamore, and yellow-poplar.

Damage Done

The total acreage severely defoliated by the gypsy moth fluctuates greatly. In 1955, for instance, only 52,000 acres were defoliated in contrast to 491,000 acres in 1954 and the all-time peak of 1,500,000 acres in 1953. The decline was due to a high incidence of disease, parasites, and predators, augmented by large-scale spray programs.

The susceptibility of a forest stand to damage by the gypsy moth depends not only on the abundance of favored food species, but also upon the site and stand conditions. Bess, Spurr, and Littlefield (1947) have pointed out that the driest sites—such as sand plains and rocky ridges—that support open stands, are the most susceptible areas, especially where land abuse is common. On soils having an adequate supply of moisture and organic matter, forest stands are often more resistant and they are characterized by full stocking and relatively vigorous growth.

Oak and pine-oak types are damaged most. Oaks seldom die unless they are defoliated in successive years, but a single defoliation causes considerable loss in the normal growth of the tree, and this effect on growth may persist for several years. Hemlocks are usually killed in a single season if they are from 75 to 100 percent defoliated. Pines are more resistant than hemlock, but severe defoliation kills them, and they may die 2 or even 3 years after being severely defoliated. Killing of some other favored food species such as gray birch and aspen also occurs.

A recent appraisal of damage by House (1952) indicates that tree mortality and growth losses in the

period 1933–52 totaled about 6½ million dollars. House also remarked that gypsy moth defoliation causes serious damage to site. The intense sunlight that is let in through the defoliated canopy dries out and compacts the soil and destroys the humus. Damage to aesthetic and recreational values is substantial.

Natural Control

Many natural control factors reduce gypsy moth populations. Winter temperatures below −20° F. kill eggs that are unprotected by snow or similar cover; late spring frosts kill newly hatched larvae; insectivorous parasites, predators, and diseases attack all immature stages; rodents eat larvae and pupae found on the forest floor; and, during severe outbreaks, when woodlands are entirely stripped of foliage, many larvae die of starvation. All together these factors do not prevent severe outbreaks occurring periodically, but they certainly help terminate outbreaks and lengthen periods between outbreaks.

Parasites and predators are very important in this respect. The gypsy moth arrived in this country without these enemies. Intensive efforts were therefore made to establish the parasites and predators here that were attacking the pest in Europe and Asia. Fifteen species have been established, and 10 of them are widespread and effective. A wilt disease is also highly effective at times. In fact, these agents now seem to be about as effective in this country as they are in central Europe, for periodical outbreaks occur there about as often as they do here.

Applied Control

Good silvicultural practices will undoubtedly increase resistance to gypsy moth damage. In some places a reduction in the favored food species may be advisable. The pest seldom causes severe damage in healthy well-managed stands.

A variety of insecticides, applied during the feeding period, can be used to control the gypsy moth. DDT is one of the most effective. It can be applied most economically by aircraft or mist-blowers. The DDT should be dissolved in a solvent such as sovacide 544B and diluted to a 12-percent solution in fuel oil or kerosene. Applications from the air or mist-blowers, when properly applied at the rate of 1 gallon per acre, give excellent control. This is at the rate of 1 pound of DDT per acre.

Precautions.—DDT is a powerful poison, and it should be handled cautiously. Fish are particularly susceptible, and careless application may cause fish mortality. Spraying from aircraft or mist-blowers to control the gypsy moth should not be done when breezes threaten to drift the insecticide over open water.

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